Nomenclature of Lipids

Appendixes A-C

Continued from Lip-3 and Lip-4

Contents of this section

Appendix A. Names of and symbols for higher fatty acids

Numerical symbol		Structure $H_3C\text{-}(R)\text{-}CO_2H$	Stems of systematic names[a]	trivial names[b]	'Name' symbol
1	10:0	$-[CH_2]_8-$	Decano-	Capr-[c]	Dec
2	12:0	$-[CH_2]_{10}-$	Dodecano-	Laur-	Lau
3	14:0	$-[CH_2]_{12}-$	Tetradecano-	Myrist-	Myr
4	16:0	$-[CH_2]_{14}-$	Hexadecano-	Palmit-	Pam
5	16:1	$-[CH_2]_5CH{=}CH[CH_2]_7-$	9-Hexadeceno-	Palmitole-	ΔPam
6	18:0	$-[CH_2]_{16}-$	Octadecano-	Stear-	Ste
7	18:1(9)	$-[CH_2]_7CH{=}CH[CH_2]_7-$	*cis*-9-Octadeceno-	Ole-	Ole
8	18:1(11)	$-[CH_2]_5CH{=}CH[CH_2]_9-$	11-Octadeceno-	Vaccen-	Vac
9	18:2(9,12)	$-[CH_2]_3(CH_2CH{=}CH)_2[CH_2]_7-$	*cis,cis*-9,12-Octadecadieno-	Linole	Lin
10	18:3(9,12,15)	$-(CH_2CH{=}CH)_3[CH_2]_7-$	9,12,15-Octadecatrieno-	(9,12,15)-Linolen-	αLnn
11	18:3(6,9,12)	$-[CH_2]_3(CH_2CH{=}CH)_3[CH_2]_4-$	6,9,12-Octadecatrieno-	(6,9,12)-Linolen-	γLnn
12	18:3(9,11,13)	$-[CH_2]_3(CH{=}CH)_3[CH_2]_7-$	9,11,13-Octadecatrieno-	Eleostear-	eSte
13	20:0	$-[CH_2]_{18}-$	Icosano-[d]	Arachid-	Ach
14	20:2(8,11)	$-[CH_2]_6(CH_2CH{=}CH)_2[CH_2]_6-$	8,11-Icosadieno-[d]		Δ_2Ach
15	20:3(5,8,11)	$-[CH_2]_6(CH_2CH{=}CH)_3[CH_2]_3-$	5,8,11-Icosatrieno-[d]		Δ_3Ach
16	20:4	$-[CH_2]_3(CH_2CH{=}CH)_4[CH_2]$	5,8,11,14-Icosatetraeno-[d]	Arachidon-	Δ_4Ach

	(5,8,11,14)	$_3$-			
17	22:0	-$[CH_2]_{20}$-	Docosano-	Behen-	Beh
18	24:0	-$[CH_2]_{22}$-	Tetracosano-	Lignocer-	Lig
19	24:1	-$[CH_2]_7CH{=}CH[CH_2]_{13}$-	*cis*-15-Tetracoseno-	Nervon-	Ner
20	26:0	$[CH_2]_{24}$-	Hexacosano-	Cerot-	Crt
21	28:0	-$[CH_2]_{26}$-	Octacosano-	Montan-	Mon

[a] Ending in '-ic', '-ate', '-yl', for acid, salt or ester, acyl radical, respectively.

[b] Ending in '-ic', '-ate', '-oyl' for acid, salt or ester, or acyl radical, respectively.

[c] Not recommended because of confusion with caproic (hexanoic) and caprylic (octanoic) acids. Decanoic is preferred.

[d] Formerly 'eicosa' (Changed by IUPAC Commission on Nomenclature of Organic Chemistry, 1975).

Appendix B. Symbols recommended for various constituents of lipids

Name	Symbol[a]
For alkyl radicals[b]	R
Methyl, ethyl, . . . dodecyl	Me, Et, Pr, Bu, Pe, Hx, Hp, Oc, Nn, Dec, Und, Dod
For aliphatic carboxylic acids[b]	Acyl (not abbreviated), RCO-
Formyl, acetyl, glycoloyl, propionyl	Fo (or HCO), Ac, Gc, Pp
Butyryl, valeryl	Br, Vl
Hexanoyl, heptanoyl, octanoyl	Hxo, Hpo, Oco
Nonanoyl, decanoyl, undecanoyl	Nno, Dco, Udo
Lauroyl, myristoyl, palmitoyl	Lau, Myr, Pam
Stearoyl, eleostearoyl, linoleoyl, arachidonoyl	Ste, eSte, Lin, Δ_4Ach
For glycerol and its oxidation products[c]	
Glycerol, glyceraldehyde, glycerone, glyceric acid	Gro, Gra, Grn, Gri
For 'glycosyl'	Ose
Glucose, galactose, fucose....	Glc[d], Gal, Fuc ...
Gluconic acid, glucuronic acid	GlcA, GlcU[e]
Glucosamine[f], *N*-acetylglucosamine	GlcN, GlcNAc
Neuraminic, sialic, muramic acids	Neu, Sia, Mur
N-Acetylneuraminic acid, *N*-glycoloylneuraminic acid	NeuAc[g], NeuGc
Deoxy	d
Miscellaneous	
Ceramide, choline, ethanolamine	Cer, Cho, Etn[h]
Inositol, serine	Ins, Ser
Phosphatidyl, sphingosine, sphingoid, Phosphoric residue	Ptd, Sph, Spd, *P*

[a] These symbols are constructed in analogy to those already in use for amino acids and saccharides [11, 13]; they may assist the abbreviated representation of more complex lipids in a way similar to the

peptides and polysaccharides. Prefixes such as 'iso-', 'tert-', 'cyclo' are specified in the symbols by lower-case superscripts (Pr^i, Bu^t, Hx^c) or lower-case prefixes (iPr, tBu, cHx), unsaturation by, e.g., Δ^3 for a 3,4 double bond, Δ^3 for a 3,4 triple bond (cf. Proteins, Vol. I, pp. 96-108, in *Handbook of Biochemistry*, 3rd edition, edited by G. Fasman, CRC Press, Cleveland, Ohio, 1976). Many of these symbols are drawn from previously published Recommendations [11, 12]. See also Appendix A.

[b] Systematic and recommended trivial names of unbranched, acyclic compounds only (cf. Appendix A). Other forms are created by prefixes (e.g., 'iso-', 'tert-', 'cyclo-'). See Appendix A.

[c] These symbols form a self-consistent series for a group of closely related compounds. It is recognized that other abbreviations (but no symbols) are currently in use. (See Lip-2.12.)

[d] Not Glu (glutamic acid) or G (nonspecific).

[e] Recommended in place of GlcUA, the 'A' being unnecessary.

[f] Approved trivial name for 2-amino-2-deoxyglucose; similarly for galactose (GalNAc), etc.

[g] AcNeu was recommended earlier [11]. When it is necessary to differentiate between N-acetyl and O-acetyl derivatives, Neu*N*Ac and Neu*O*Ac (italicized locants, in contradistinction to GalNAc, etc.) may be employed.

[h] May take the form OEtN< if substitution on the nitrogen atom is to be indicated.

Appendix C. Abbreviated representation of gangliosides

Lipid Document[a]	Designation according to Wiegandt[b]	Svennerholm[c]
1. I^3NeuAc-GalCer	G_{Gal}1NeuAc	-
2. II^3NeuAc-LacCer	G_{Lac}1NeuAc	G_{M3}
3. II^3NeuGe-LacCer	G_{Lac}1NeuNGl	-
4. $II^3(NeuAc)_2$-LacCer	G_{Lac}2NeuAc	G_{D3}
5. II^3NeuAc/NeuGc-LacCer	G_{Lac}2NeuAc/NeuNGl	-
6. II^3NeuGc-LacCer	G_{Lac}2NeuNGl	-
7. II^3NeuAc-$GgOse_3$Cer	G_{Gtri}1NeuAc	G_{M2}
8. II^3NeuAc-$GgOse_4$Cer	G_{Gtet}1NeuAc	G_{M1}
9. IV^3NeuAc-$nLcOse_4$Cer	G_{Lntet}1aNeuAc	$G_{M1\text{-}GlcNAc}$
10. IV^6NeuAc-$nLcOse_4$Cer	G_{Lntet}1bNeuAc	-
11. IV^2Fuc,II^3NeuAc-$GgOse_4$Cer	G_{Gfpt}1NeuAc	-
12. IV^3NeuAc-$nLcOse_4$Cer	-	-
13.		

$II^3(NeuAc)_2$-$GgOse_4Cer$	$G_{Gtet}2bNeuAc$	G_{D1b}
14. IV^3NeuAc,II^3NeuAc-$GgOse_4Cer$	$G_{Gtet}2aNeuAc$	G_{D1a}
15. $II^3(NeuAc)3$-$GgOse_4Cer$	$G_{Gtet}3bNeuAc$	-
16. $IV^3NeuAc,II^3(NeuAc)_2$-$GgOse_4Cer$	$G_{Gtet}3aNeuAc$	G_{T1}
17. $IV^3NeuAc,II^3(NeuAc)_3$-$GgOse_4Cer$	$G_{Gtet}4bNeuAc$	-
18. $IV^3(NeuAc)_2II^3(NeuAc)_3$-$GgOse_4Cer$	$G_{Gtet}5NeuAc$	-
19. IV^3NeuAc,II^3NeuAc-$GgOse_5Cer$	$G_{Gpt}2aNeuAc$	-

[a] To indicate linkage points and anomeric form: Fuc should be written (←1αFuc); NeuAc should be written (←2αNeuAc); $(NeuAc)_2$ should be written $(\leftarrow 2\alpha NeuAc8)_2$; etc. If these features are assumed or defined, the short form used in this column is more convenient for use in texts and tables.

[b] The subscripts to G (for ganglioside), from 7 on, have the meanings: Gtri = gangliotriose, Gtet = gangliotetraose, Litet = lactoisotetraose, Gpt = gangliopentaose, Gfpt = gangliofucopentaose [Wiegand, H. (1973) *Hoppe-Seyler's Z. Physiol. Chem.* **354**, 1049].

[c] G = ganglioside, M = monosialo, D = disialo, T = trisialo. Arabic numerals indicate sequence of migration in thin-layer chromatograms [Svennerholm, L. (1963) *J. Neurochem.* **10**, 613].

Continued with Supplement: derivatives of phosphatidic acid

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